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Conceptual Paper

# A Note on Nipah Virus

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## Abstract

Nipah virus is a potential threat to the living beings as it is zoonotic in nature and has a fast rate of transmission. This disease has also potential to turn into pandemic as witnessed in coronavirus infection. The disease is caused by henipavirus and is an emerging disease. Pigs are the primary animal species affected however dogs, goats, cats, horses and sheep can also be infected. Since there is much to learn about this disease including the way it is spreads, the best way is to prevent it. The best prevention is to prevent pigs from having contact with fruit bats, and to prevent other animals from coming into contact with Nipah virus-infected pigs. In humans illness can vary from no signs of illness to death.

**Keywords:** Nipah; Zoonotic; Henipavirus; Pigs; Prevention

## Introduction

Nipah viral disease is a zoonotic infection and an emerging disease caused by Nipah virus (NiV), an RNA virus of the genus Henipavirus, family Paramyxoviridae, which is transmitted by specific types of fruit bats, mainly *Pteropus* spp. Nipah is a recently discovered viral disease that can affect people and animals. Severe respiratory disease, encephalitis, even death can result. Outbreaks of Nipah have only been reported in Southeast Asia (i.e., Malaysia, Singapore, India, and Bangladesh).Pigs are the primary animal species affected by Nipah virus. Dogs, goats, cats, horses and possibly sheep can also be infected. The virus is thought to be maintained in nature by fruit bats, which show no signs of infection. Pigs become infected through contact or ingestion of objects or materials contaminated by the urine, feces or saliva from infected flying foxes. The virus can also spread between pigs by direct contact and by aerosol. Other animal species become infected by having contact with sick pigs or objects contaminated with the virus. Pigs infected with Nipah virus will have rapid and difficult breathing pattern. They may also have open-mouthed breathing and a characteristic loud, harsh cough. Fever is common. The nervous system may also be affected, so signs such as trembling, muscle spasms, lameness, and incoordination may be seen. Sudden death can occur. Nipah virus outbreaks in pigs have only occurred in Malaysia and Singapore. Since Nipah virus is newly discovered, there is still much to learn about this virus, including the way it is spread and how to best prevent it. The best prevention advice at this time is to prevent pigs from having contact with fruit bats, and to prevent other animals from coming into contact with Nipah virus-infected pigs. Human illness can vary from no signs of illness to death. Infection most commonly occurs from close contact with infected pigs. Initially flu-like symptoms, such as fever, headache and muscle pain, are seen. This may be followed by neurological signs such as disorientation, dizziness. During the 1998-1999 epidemic in Malaysia, 40-50% of the human cases resulted in death [1].

## Spread

- Pigs become infected through contact or ingestion of objects or materials contaminated by the urine, feces or saliva from infected flying fruit bats that are the carriers of the virus. The virus also spread between pigs by direct contact and by aerosol. Animals other than pigs become infected by having contact with sick pigs or objects contaminated with the virus.
- Spread of Nipah virus to humans may occur after close contact with other Nipah infected people, infected bats, or infected pigs. Bat secretions laden with virus can infect people during fruit tree climbing, eating or handling contaminated fallen fruits or consuming raw date palm sap or juice or toddy.
- Human to human infection can occur from close contact with persons affected with Nipah at home while providing care or close contact and in hospital setting if;appropriate personal protective equipments are not used.

- Handling of dead bodies, suspected of death due to Nipah virus should be done in accordance with the government advisory. During this emotional moment traditional rituals and practices may need to be modified to prevent the exposure of family members to the disease [2].

## Pathogenesis

- In the initial stage of disease, the Nipah virus can be detected in epithelial cells of the bronchiole. Viral antigens can be detected in bronchi and alveoli of the lungs of the animals infected with the virus. The primary target of the virus being epithelium of bronchi and type II pneumocytes present in alveoli of lungs [1].
- From the respiratory epithelium, the virus is disseminated to the endothelial cells of the lungs in the later stage of the disease.
- Subsequently, the virus can gain entry into the blood stream followed by dissemination, either freely or in host leukocyte bound form.
- Apart from lungs, spleen and kidneys along with brain may act as target organs leading to multiple organ failure [2].
- Two pathways are involved in the process of viral entry into the central nervous system (CNS), via hematogenous route and via olfactory nerve.
- The blood brain barrier is disrupted and interleukin-2 along with tumor necrosis factor are expressed due to infection of the CNS by the virus which ultimately leads to development of neurological signs.

## Clinical signs and symptoms

Highly pathogenic Nipah virus causes symptomatic infections in pigs and humans. Respiratory system is majorly affected in all species counteracting with infection but, respiratory symptoms are much more severe in pigs as compared to humans [1].

## In humans

- The virus is responsible for causing severe and rapidly progressing illness in humans with the respiratory system as well as the central nervous system (CNS) mainly getting affected.
- The signs and symptoms of the disease appear 13-14 days post Nipah virus exposure. Initially, there is a high rise of temperature along with drowsiness and headache.
- This is followed by neurological signs including mental confusion as well as disorientation, ultimately progressing towards coma within 1-2 days.
- A critical complication of the Nipah virus infection is encephalitis which is the cause of neurological signs in humans [3].
- During initial phase, the respiratory problems may become evident. There is development of atypical pneumonia. Coughing along with acute respiratory distress may be evident in certain patients.

## In animals

- In pigs, the disease is also known as porcine respiratory and encephalitis syndrome (PRES), barking pig syndrome (BPS) or one-mile cough.
- An acute febrile illness has been reported in pigs below six months of age wherein there is development of respiratory illness that ranges from rapid labored breathing to non-productive cough which is harsh in nature [1].
- With the exception of young piglets, the mortality is relatively low. It is almost non-fatal or non-mortal in case of older pigs.
- In animals that are confined, morbidity may approach 100 per cent and it is much less in case of free range animals. This is because, in case of confined animals they remain clustered and close to each other whereas in free range they are scattered throughout the area.
- Due to involvement of nervous system, there may be twitching of muscles, weakness of hind legs, tremors, along with paresis, either flaccid or spastic, of varying degrees [1].

## Prevention

- In areas where Nipah virus is common, it is recommended that individuals practice regular hand hygiene, avoid close contact with domestic animals and other individuals at high risk of Nipah virus exposure, and avoid areas that fruit bats are known to occupy.
- Prevention of infection in livestock could be an efficacious strategy in regions where they serve as intermediate hosts. It involves keeping fruit bats as well as roosting trees away from the livestock farms and grazing lands susceptible to virus contamination.
- Proper washing of the vegetables as well as fruits is essential to remove traces of bat excreta. Avoid food or drink products at high risk of contamination by fruit bats, such as raw date palm sap, raw fruits, or fruit found on the ground.
- The development of a Nipah virus vaccine for use in pig populations would decrease the major risk the Nipah Virus poses to both animal and human health.
- Additional and ongoing preventive measures include raising awareness and continuing research on the Nipah virus and its transmission; increasing surveillance of domestic animals, fruit bats, and people in areas where Nipah virus is known to exist; evaluating new methods to minimize Nipah virus transmission between species; and developing new tools to detect early Nipah virus infection in humans and animals.

## Treatment

There is currently no cure or vaccine to treat the Nipah virus. Treatments are limited to supportive care to treat the emerging signs and symptoms of the illness. If further complications are seen, consideration needs to be taken to treat possible cases of en-

cephalitis which can be transmitted from one person to another.

## Conclusion

Therefore, it is important to implement standard infection control practices to limit transfer of virus.

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